MCMs: enabling GaAs?

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The multi-chip module (MCM) is another one of those enabling technologies that has its champions and its critics. But it looks likely that MCMs are presenting a serious challenge to the traditional ASIC design route. Designers are using MCMs which combine the best available devices — silicon and GaAs — at their initial design iteration stages because they have advantages that ASICs do not have. An MCM-based design can make the difference in being first to market with fewer compromises in performance.

There is no doubt that the MCM cause has been helped by many companies committing to growing the complement of tested die. They have also made the investment in the new skills required for MCMs, i.e. the handling of bare die, test and burn-in, etc. However, there are those who are dismissive of MCMs and would prefer designers to stay with ASICs.

This makes some sense because the MCM is perhaps no different from the gate array ASIC in that it is an intermediate step towards a perfected design solution — if there is such a thing.

Yet this misses a vital point: the MCM solution can help get a new system to market more quickly than the competition. Unlike the MCM, the gate array or the PLD (programmable logic device) have significant imperfections as regards design optimization. Gate arrays are notoriously inefficient users of silicon real estate and PLDs fall short of ideal performance but they are cheap. But price is less of a factor at the initial market launch stage.

The traditional ASIC design house might thus be wise taking time to consider broadening its design portfolio to distinguish itself from the rest. Perhaps it should consider doing this through technologies such as GaAs, SOI, optoelectronics or even MEMS. Also such services which can help customers achieve their targets more efficiently, promptly and with reduced risk. Contrary to opinion, MCMs can, and will, fulfil many of these needs and will be considered as an extension of the business and not as 'unusual' or 'difficult'.

Securing the contract with an OEM must be done as early on in the design process as possible. In this way the project is on course to staying through all design iterations. A supplier who helps the OEM get the system to market ahead of the competition will likely have a partnership that will endure. This is a critical stage and one where the MCM can play a pivotal role by providing a technical edge at the market debut and thereby capturing the market.

In due course the design undergoes revision and the MCM design is likely be converted into a monolithic one which may well be via an ASIC. The key point here being that the ASIC will be better matched to the volumes demanded at this stage over the smaller ones of the initial launch design. As initial product is establishing the market, feedback of information will assist design refinement.

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Today's MCM designer can choose from a growing range of devices of known good die (KGD) enabling the design to more closely match the OEM's ideal design solution. Not only that, MCMs can offer considerable profit incentives for the supplier. There is a tendency in certain quarters to stick with the familiar and insist on an ASIC solution. Little consideration is given to, or understanding of, the potential of smaller volumes of higher priced devices such as MCMs.

This can be rationalised thus: if you aim to achieve sales of $100 000 you could sell standard parts (such as PLDs) at a dollar each but you would have to sell 100 000 of them. Alternatively, you could sell gate arrays at around $100 each and in this case you would need to sell a thousand. MCMs, however, implicitly have a higher unit cost and initial orders would amount to no more than a dozen at a few thousand dollars apiece. This seems unattractive but it might just enable the supplier to secure all the follow-on business as well.

The argument over MCMs being just another step towards the ASIC will doubtless continue for a few more years yet. However, the MCM is reaching a level of maturity where it must not be dismissed so lightly. Not only has the MCM much to offer in terms of packaging versatility but also in making contributions to business leverage — but only to those who choose to exploit their uniqueness.

Players in the GaAs MMIC field could especially benefit from the wider adoption of MCMs. I expect that it will be those with device technologies spanning the whole range from CMOS, bipolar and BiCMOS silicon through to GaAs microwave circuits, SOI/S and optoelectronics who will be the best placed to benefit from the MCM.